



# Tech in the World

Global health fellowships for tomorrow's leaders in technology

## The President's Challenge

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## Executive Summary

Global health is one of the most pressing issues facing our world today: three of the eight Millenium Development Goals, agreed upon by all 193 UN member states, are focused on improving the health of people around the globe. Recent improvements in electrical and computing infrastructure and the rapid proliferation of mobile technology has radically changed the landscape of global health, and has ushered in new fields around mHealth and global health informatics. Computer science now plays a critical role in global health delivery, and will only continue to increase in importance in effective global health interventions.

However, the progress in bringing together the fields of computer science and global health has been slow. There is a lack of technical ability around computer science and software engineering at all levels: the technical knowledge needed to properly design, deploy, and integrate software solutions, the raw manpower needed to build and maintain software, and the thought leadership needed to create scalable and widely usable software systems. Much of this can be traced back to the lack of a clear pipeline for computer science students to learn about, join, and contribute to the intersection of computer science and global health.

Tech in the World is a non-profit organization providing global health fellowships to top computer science students. We identify the best computer science students, with both technical talent and leadership capacity, and send them in teams of four to one of our overseas locations to develop software solutions for partner organizations and learn about international health and development. It is a structured and immersive experiential learning opportunity: The fellowship involves an intensive pre-departure training program and the opportunity to contribute and impact a local organization in a developing country.

Tech in the World was founded in August 2012 and recently completed a successful one-month pilot in Tanzania that demonstrated the value of the fellowship model to both the student fellows and all partner organizations involved. We had formed a team of four computer science students and one documentary film student and spent 31 days in Dar es Salaam, where we developed software solutions for Bienmoyo Foundation and the Association of Private Health Facilities in Tanzania, led workshops and seminars at the Dar es Salaam Institute of Technology, and learned from local experts in development from the World Bank, the Clinton Health Access Initiative, the Ifakara Health Institute, and more. Our pilot program raised over \$12,000 from private donations and five grants, included a pre-departure training program spanning two full days, and was captured in a documentary to be released in March 2013.

## The Team: Why We're Ready to Take This On

### Brandon Liu: Co-Founder and Co-Director

- 3rd-year studying Computer Science at Harvard
- Software development experience at RapLeaf, Knewton, and Asana
- Previously Technical and Product Lead at Remindavax, an electronic medical record system serving over 4,000 pregnant women in rural India.
- Technical Director at HackHarvard
- StartingBloc Social Innovation Fellow, Kairos Society Global Fellow, NYC Turing Fellow, and Resolution Project Social Entrepreneurship Fellow



### Joshua Lee: Co-Founder and Co-Director

- 3rd-year studying Computer Science at Harvard
- Software development experience at Pivotal Labs
- Teaching fellow for Harvard's CS50 and CS51
- Resolution Project Social Entrepreneurship Fellow
- Former Director of HSYLC, Harvard's largest student run summer conference in China
- Former Emergency Medical Technician



## The Problem: At the Intersection of Computer Science and Global Health

The problem that Tech in the World addresses is a two-sided problem that affects both computer science students and existing organizations working in global health.

In our conversations with a number of professionals in global health and development as well as our research into global health organizations, we have repeatedly found that there is a shortage of software engineers and computer scientists to work on critical problems in the field. Mobile applications for easy data collection, electronic medical record systems for health clinics, and data visualization tools for researchers all require a computer science skillset, and there is a strong demand for these skills.

In our experiences learning about mHealth in Tanzania, we also found that many organizations were not simply limited by their ability to develop software solutions (which could be contracted out to software development firms or freelance contractors at cost), but were further limited by poor product and project management. Software design and specification is often conducted without a thorough needs assessment of the users, knowledge of existing user behaviors, or understanding of the unique constraints of deploying technology in a resource-limited setting with poor infrastructure. As a result, many organizations design and develop software solutions that face significant barriers to adoption and ultimately do not effectively solve the problem.

We believe that this is in part due to the lack of a pipeline for computer science students to enter the field of global health. As computer science students ourselves, we have observed that most of our peers do not explore careers in global health due to a number of barriers that exist:

1. **Knowledge** of how computer science skills may be applied to global health is not widespread, and many students do not realize the immense opportunity for impact.
2. Many students are not **aware** of the opportunities and demand for computer science and software skills in global health and development.
3. There is a lack of **structured opportunities** for computer science students to learn more about global health, receive mentorship and guidance, and have an immersive experience applying their technical skills to concrete problems in order to determine whether a career in global health would be right for them.

The first two barriers exist in varying degrees at different universities and are ameliorated by various events and student organizations, such as Harvard College's own nascent organization called Developers for Development. However, the third barrier remains one that must be addressed in order to bring more top computer science talent into global health and development. Tech in the World is designed to address this very problem.

## **Our Solution: Global Health Fellowships for Tomorrow's Leaders in Technology**

Tech in the World intends to become a premier fellowship program, providing an overseas immersive program for top computer science students to have the experience of applying technical skills to global health problems. We identify the best computer science students, with both technical talent and leadership capacity, and send them in teams of four to one of our overseas locations for one month to develop software solutions for partner organizations and learn about international health and development.

All Tech in the World fellows go through a comprehensive **pre-departure training program** to prepare the fellows for their work abroad. The training program includes several modules, including an introduction to global health, cultural sensitivity, medical ethics, country-specific overview, negotiation and communication skills, and health technologies in resource-constrained settings.

Fellowship teams work with partner organizations to identify and **develop software solutions** for their most pressing needs. In doing so, the fellows have a concrete impact for the partner, become intimately familiar with a particular issue in global health, collaborate with organizations in global health, and learn about the unique challenges of developing and deploying software solutions in resource-constrained settings.

An integral part of the fellowships program is to learn more about **local conditions** by engaging with the community. Fellows collaborate with computer science students at local universities and lead workshops to share knowledge and skills. This gives the fellows the chance to learn about the opportunities and challenges of their peers abroad. Fellows also meet with local experts working in health and development to get a broad understanding of the range of efforts in global health and development.

Most of all, the fellows gain **cultural awareness** and a **global perspective** on health and technology through the international experience.

After the trip, the fellows join an alumni network of like-minded peers and gain access to continued career guidance, career opportunities, and a network of mentors in global health and technology.

## The Impact

For our **fellows**, we hope to create a transformative experience that provides leadership development, personal growth, and a broad, global perspective of health and technology.

For our **partners**, we hope to provide meaningful technical expertise and manpower to create technological solutions for their most pressing needs.

For our **nation's universities**, we hope to build awareness of global health and global development as a potential career option for computer science students. We hope to demonstrate the growing technology needs in the world and the innumerable opportunities for leaders and technologists to make an impact.

For the **world**, we hope to increase the flow of software talent into global health and global development, and we hope to develop the next generation of leaders in technology.

## Press

Harvard Gazette

[news.harvard.edu/gazette/story/2013/01/tech-solutions-for-tanzanian-health-care/](http://news.harvard.edu/gazette/story/2013/01/tech-solutions-for-tanzanian-health-care/)

Harvard Committee on African Studies

[africa.harvard.edu/harvard-undergrads-pilot-tech-program-in-tanzania/](http://africa.harvard.edu/harvard-undergrads-pilot-tech-program-in-tanzania/)

The Information Society and ICT Sector Development Project in Tanzania

[tanzict.or.tz/2013/01/04/project-showcase-and-office-hours/](http://tanzict.or.tz/2013/01/04/project-showcase-and-office-hours/)

Harvard Crimson

[thecrimson.com/article/2012/12/12/students-tanzania-computer-science/](http://thecrimson.com/article/2012/12/12/students-tanzania-computer-science/)

## Our Progress: A Successful Pilot in Tanzania

Tech in the World was founded less than six months ago in August 2012. Since then, we have been working hard to put together a pilot program to evaluate the effectiveness of our fellowship model. In particular, we wanted to test whether the fellows found it a valuable experience and whether a month was sufficient time to provide concrete value to our partner organizations.

Before the pilot program, we evaluated a number of different potential partner organizations and ultimately decided to work with both [Bienmoyo Foundation](#) and the [Association of Private Health Facilities in Tanzania](#) (APHFTA). We chose to work with Bienmoyo and APHFTA because they had already deployed an electronic medical record system to two dozen clinics, and so had demonstrated an appreciation for and commitment to technology. In addition, they had some technical capacity to maintain our software after the pilot.

We recruited three Harvard undergraduates to join our pilot team: Salvatore Rinchiera (Computer Science '14), Christian Anderson (Math/Physics/Computer Science '13), and Mateus Falci (VES '14). We established a board of advisers and built out a network of mentors and coaches that includes:

- Dr. David Ager, Harvard Business School
- Jackie Stenson, Co-Founder of Essmart
- Annemarie Ryu, CEO of Global Village Fruits and CEO of Remindavax
- Professor Hamish Fraser, Harvard Medical School, Director of Informatics and Telemedicine at Partners in Health
- Andrew Bentley, Co-Founder of Global Health Corps
- Jennifer Pahlka, Founder and Executive Director of Code For America
- Paula Goldman, Director at Omidyar Network
- Cari Tuna, President of GoodVentures

We were also able to raise roughly \$14,000 for Tech in the World through 22 private donations and five grants from the Harvard School of Engineering and Applied Sciences, Resolution Project, The Awesome Foundation, GoodVentures, and the Omidyar Network. Bienmoyo Foundation sponsored our donations to give them tax-exempt status and APHFTA covered \$2,000 worth of housing costs in Tanzania.

Before leaving for Tanzania, we organized a two day pre-departure training program that included meeting with students who had previously worked in Tanzania, professors at Harvard Medical School and the Harvard School of Public Health, and a 6-hour training session with the Harvard Global Health Institute.

### In Tanzania

During our one month stay in Tanzania, we were able to complete three software projects for APHFTA, teach local university students, and learn from a wide range of local experts in development.



We worked with Bienmoyo and APHFTA to identify three well-defined projects that could be completed in a short time frame:

1. We developed a membership database that allows APHFTA to manage information, statistics, and financials of its membership of over 550 private health clinics. The membership database allowed APHFTA staff across the country to view and edit membership data in a centralized and organized manner.
2. We developed a SMS reminder application that allows doctors and nurses to register patients, schedule appointments, and assign medicine regimens. The system automatically sends SMS reminders before the appointment, SMS follow-ups in case of missed appointments, and regular SMS reminders according to the patient's medical condition and medicinal regimen.
3. We developed a suite of data visualization tools that allowed Bienmoyo and APHFTA to better track the usage of their existing electronic medical record system, including graphs on page views, form submissions, data completeness, and time spent per page.

We developed a strong relationship with Professor Mwasaga, head of Computer Engineering at the Dar es Salaam Institute of Technology (DIT), where we met one to two times a week with his class of 3rd and 4th year students studying computer engineering. We learned about the projects that they were working on and also led workshops and seminars in web security, web development, parallel programming, and online computer science resources.

Finally, we set up a number of meetings with local experts working in health and development, including:

- Doctors and nurses at various APHFTA clinics
- Local Tanzanian developers at the Dar Teknohama Business Incubator
- Country Director for Tanzania and IT Manager of D-Tree International
- Country Director for Tanzania at the World Bank
- CEO of Hindu Mandal Hospital and Vice President of the International Diabetes Federation
- Program Manager at the Clinton Health Access Initiative
- The Finnish Technical Assistance Team at The Information Society and ICT Sector Development Project in Tanzania (TANZICT)
- Researchers at the Ifakara Health Institute

## **The One-Year Plan: Growing and Scaling**

For this next year, we plan on building out the brand image for the Tech in the World fellowship, raising awareness around global health and computer science, creating chapters at Harvard and MIT, selecting 8 fellows for our inaugural class of fellows, and expanding our support services for our fellows.

**February:** Gather pilot evaluation data from both fellows and all of our partner organizations. Complete documentary film and other media materials; recruit additional team member to manage brand strategy, develop our message, and design our online presence.

**March:** Form a 501c3. Run a publicity campaign to raise awareness of the fellowship and the opportunities in global health informatics. Continue to develop key relationships with student leaders at Harvard and MIT to source promising candidates.

**April:** Initiate rigorous evaluation of overseas partners. Reevaluate existing partnerships in Tanzania and develop an additional overseas location. Revisit existing donors, scope out new sources of funding, and build institutional partnerships with Harvard and MIT.

**May:** Begin to identify and recruit individuals for our fellows selection committee. Begin to develop relationships with key partners and resources for the pre-departure training program.

**Summer:** Open up application. Continue to gather resources for the fellows.

**September:** Application deadline by end of September.

**October:** Conduct technical screens over phone for 2nd-round candidates. Select 16 finalists for a one-day event to network and learn from professionals in global health. Conduct non-technical final round interview in-person and select fellows.

**November:** Team-building exercises for fellowship teams. Planning and preparation for fellowship trip (connecting with partner organization, preliminary software design, language preparation, etc.)

**December:** Pre-departure training program.

**January:** Fellowship teams abroad!

Our long-term vision is to have a 1-month winter fellowship, a 10-week summer fellowship, and a 2-year post-graduate fellowship that create a pipeline for computer science students to progressively get more involved in global health and enter the field. We will also expand to include fellows from universities across the country.

## **Support and Resources: How We Need Your Help**

We have identified the following five categories of resources that we will need to acquire to execute on our one-year plan:

1. *Evaluations committees for selection process.* We intend to form a committee of professional software engineers to conduct the 2nd-round technical screening and a committee of global health leaders to conduct the final round interviews. We will identify these individuals from our network of software engineers and global health professionals.
2. *Pre-Departure Training Program.* We will be seeking to partner with institutions and individuals to provide comprehensive training services to our fellows. Partners that we have in mind include the Harvard Negotiation Project, Dimagi, Partners in Health, MIT Global Health Delivery Lab, and the Harvard Global Health Institute. We have existing relationships with some of these partners but plan on developing further relationships through our network.



3. *Partners and network in overseas locations.* This year we will need to develop an additional overseas location and establish relationships with local health organizations, a local university, and local professionals in health and development. We believe we will be able to accomplish this with our network of global health professionals.
4. *Mentorship for executive team.* We continually seek feedback, guidance, and mentorship for the executive team. We have already developed a small group of mentors and advisers but we are always looking for greater mentorship.
5. *Finances.* Based on our pilot program, we estimate that the fellowship costs roughly \$2,500 per fellow, which gives us a funding goal of at least \$20,000 for 2013. We believe this is achievable through reengaging past donors and acquiring new sources of funding through our network. In particular, we hope to build long-term partnerships with academic institutions to provide yearly funding for fellows from their university and establish new relationships with corporate sponsors in technology. We also will be asking our primary partner organizations abroad to contribute to fellowship expenses.

## **Financial Breakdown**

If we are selected as finalists, 90% of the \$5,000 will go entirely toward covering expenses of the fellowship trip and costs associated with any other fellowship services we provide. In particular, the money would be used to cover airfare, vaccinations, visa fees, room and board, and local transportation.

The remaining \$500 will be used for publicity and media materials to raise greater awareness around global health and computer science and to attract top candidates to our fellowship.

## **Evaluations and Metrics: How Do We Know When We Succeed?**

Above all else, it is of paramount importance to have success metrics and an evaluation methodology so that we can evaluate whether we are achieving our mission and determine courses of action to improve our organization. We have identified four categories of continual evaluation and improvement:

1. *Fellowship Experience.* We continually interview, survey, and discuss with fellows on the fellowship experience to learn about what went well and what could be improved. We ask fellows to complete comprehensive pre-departure and post-fellowship surveys, engage them in focus group discussions, and continue to follow up after the fellowship trip.
2. *Partner Organizations.* We want to know whether our partner organizations had a positive experience working with Tech in the World fellows and how we can further improve the experience. We ask for feedback from partners during the fellowship trip and ask all partners to fill our evaluations after the trip to identify areas of success and areas for improvement.

3. *Software Impact.* We follow up with our partners months after the fellowship trip to evaluate the adoption and long-term impact of the software solutions created. We also build in metrics into the software to automatically evaluate its usage and impact.
4. *Raising Awareness.* To measure the reach of our message, we will look at a number of indicators, including page views to our website and blog, view of our documentary film, number of attendees at events, and number of applications to the fellowship program.

## **Risks, Precautions, and Contingency Plans**

We believe the following risks are most likely to negatively impact the fellowship, and we have precautions and contingency plans in place to minimize their impact.

1. *Safety.* As with any kind of international travel, safety is always our top priority and top consideration. We are careful to select overseas locations that are known to be safe and politically stable, we conduct thorough safety training during our pre-departure training program, and we work with partners such as Harvard Global Support Services to ensure the safety of our fellows.
2. *Developing an additional overseas location.* There is the risk that we will not be able to successfully find a suitable partner organization in another location. However, conversations with potential partners in Nairobi, Kenya, and Phnom Penh, Cambodia, suggest that we should have no problem finding suitable partners.
3. *Meeting fundraising goals.* In the unlikely case that we are not able to meet our fundraising goal, we will have to (1) ask the fellows to help fundraise; (2) ask fellows to pay a portion of expenses themselves; or (3) push costs to be covered in the next funding cycle. However, the enthusiasm we've observed from our existing donors suggest that meeting our fundraising goal should be well within our reach.
4. *Team conflict among fellows.* Conflict between team members is always a risk and has the potential to significantly disrupt the experience. We plan to minimize this risk by incorporating negotiation and communication training in our pre-departure program, organizing team-building activities for the fellowship team, and establishing team norms and structures to minimize conflict.